

Money and Modern Banking without Bank Runs

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Motivation

Does Diamond-Dybvig theory of bank runs justify deposit insurance in developing and developed countries?

1983: 21 countries have deposit insurance

- Diamond-Dybvig: Deposit insurance prevents liquidity runs

2006: 87 countries have deposit insurance

- Primarily developed countries

1983 – 2006: Deposit insurance linked to:

- Moral hazard and bank failures, e.g. S&L crisis
 - Demirguc-Kunt and Detriage (1997,2002), Nagarajan and Sealey (1995), Penati and Protopadakis (1988), Martin (2006), Kim and Santomero (1988)
- Rent-seeking private interests, particularly “developed” countries
 - Kroszner (1998), Kroszner and Strahan (2001) and Laeven (2004), Demirguc-Kunt et al. (2005)

Traditional Banking

Bank run threat in developing countries

“Real World”

Theory

Developing countries
1800s-1930s U.S. bank runs

- Fixed value of deposits
- Currency withdrawn from banking system

Diamond-Dybvig

- Real demand deposits paid in goods

Depletion from banking system \Rightarrow liquidity runs

Deposit insurance prevents liquidity runs

Introduce: “Modern” Banking

Bank run threat in developed countries

“Real World”

Theory

Developed countries

- Flexible value of deposits
- Intraday electronic payments
- No currency withdrawals

- Nominal money deposit
⇒ monetary market prices
- Clearinghouse model
⇒ interbank lending

No depletion from banking system ⇒ no liquidity runs

Diamond-Dybvig does not justify deposit insurance

Bank Run Literature

Bank runs due to real goods withdrawn from banking system:

Multiple equilibria, asset shocks or asymmetric information:

- Diamond-Dybvig, Allen and Gale (1998), Calomiris and Kahn (1991), Chari and Jagannathan (1988), Diamond and Rajan (2005, 2006)

Interbank lending:

- Bhattacharya and Gale (1987), Bhattacharya and Fulghieri (1994), Allen and Gale (2000a), Diamond and Rajan (2005)

Partial equilibrium models of money:

- Bryant (1980), Chang and Velasco (2000), Gale and Vives (2002), Freixas et al. (2000, 2004), Freixas and Holthausen (2005), Rochet and Vives (2004), Peck and Shell (2003), Postlewaite and Vives (1987), Repullo (2000), Allen and Gale (1998, 2000b)

Outline of Results

Simple model to examine liquidity issue of mismatch in asset/liability maturity

Two potential types of runs & two model *innovations*

I. No “Purchase Runs”

- Monetary prices for goods adjust
- ***Nominal unit of account***

II. No “Redeposit Runs”

- Clearinghouse and interbank lending
- ***“Payment-in-the-Same-Period” constraint***

Real Model Setup

Three periods: $t = 0, 1, 2$

Unit mass of consumers

- $t=0$: endowment of 1 good
- $t=1$: learn private types
 - λ early: $u(c_1)$
 - $1-\lambda$ late: $u(c_2)$
 - $c_t =$ consumption at period t

Technology

- Storage returns 1 over a period
- Investment at $t=0$ returns:
 - $r > 1$ at $t=2$
 - or— $s < 1$ at $t=1$ if liquidated

Real Model Results

Optimal Allocation

$$\max_{c_1, c_2, \alpha} \lambda u(c_1) + (1-\lambda)u(c_2)$$

$\alpha \leq 1$ is amount of goods invested

$$\text{FOCs} \Rightarrow c_1^*, c_2^*, \alpha^*$$

Bank with Real Demand Deposits: Diamond-Dybvig

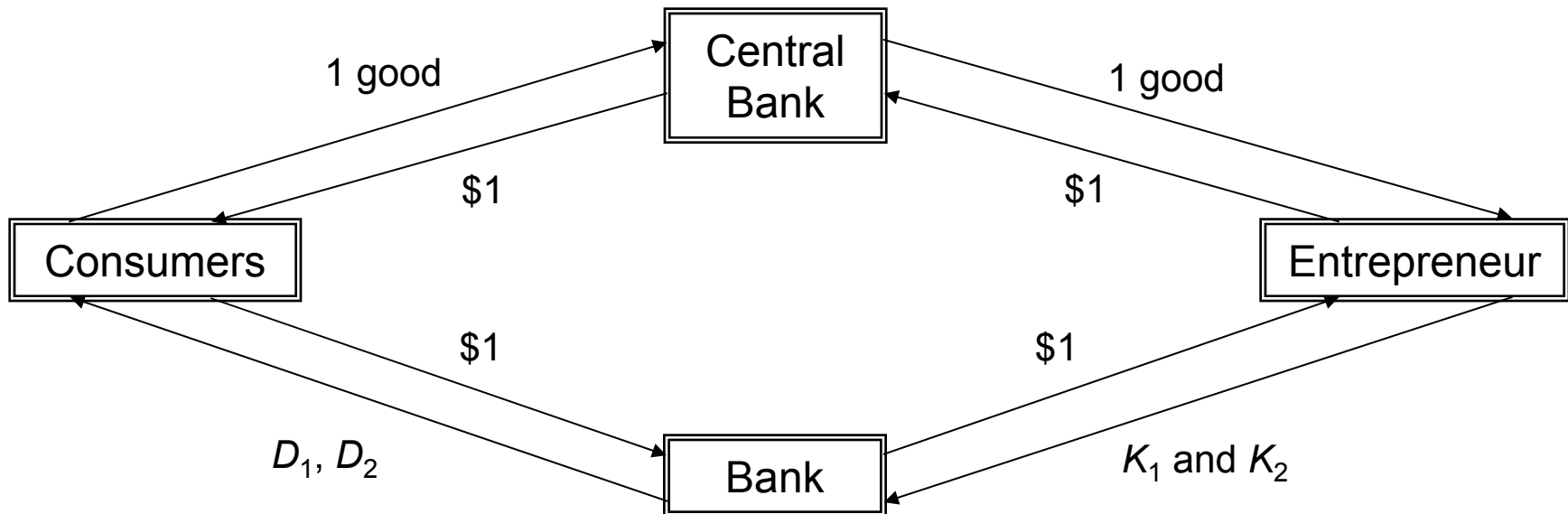
- Deposits pay c_1^* at $t=1$ or c_2^* at $t=2$
- Multiple equilibria with bank runs

Bank with Nominal Deposits

Add to Diamond-Dybvig real model:

1. Entrepreneur: Store & invest goods, sell competitively
2. Money and nominal contracts
 - $t=0$: Central Bank sets $P_0=1$ then no role after

Nominal unit of account established at $t = 0$



I. Single Bank Model

Consumers:

$t=1$: $\lambda^p \geq \lambda$ withdraw D_1 and purchase goods

$t=2$: $1-\lambda^p$ “ D_2 “ “ “

- Bank run $\equiv \lambda^p > \lambda$ (“Purchase Run”)

Prices: Market clearing condition

- $P_1 = \frac{\lambda^p D_1}{q_1}$ $P_2 = \frac{(1-\lambda^p) D_2}{q_2}$

- Entrepreneur sells q_t goods at time t

- To repay K_t and maximize profits

- Excess revenues $(P_1 q_1 - K_1)^+$ deposited at rate $D_{1,2} = \frac{D_2}{D_1}$

Entrepreneur and Consumers

Entrepreneur:

- FOC $\Rightarrow P_1 \geq \frac{P_2}{D_{1,2}}$
 $\Rightarrow \frac{\lambda^p D_1}{q_1} \geq \frac{(1-\lambda^p) D_2}{q_2 D_{1,2}}$

Late consumers withdraw if: $\frac{D_1}{P_1} > \frac{D_2}{P_2} \Leftrightarrow P_1 < \frac{P_2}{D_{1,2}}$
 \Rightarrow Contradiction to FOC

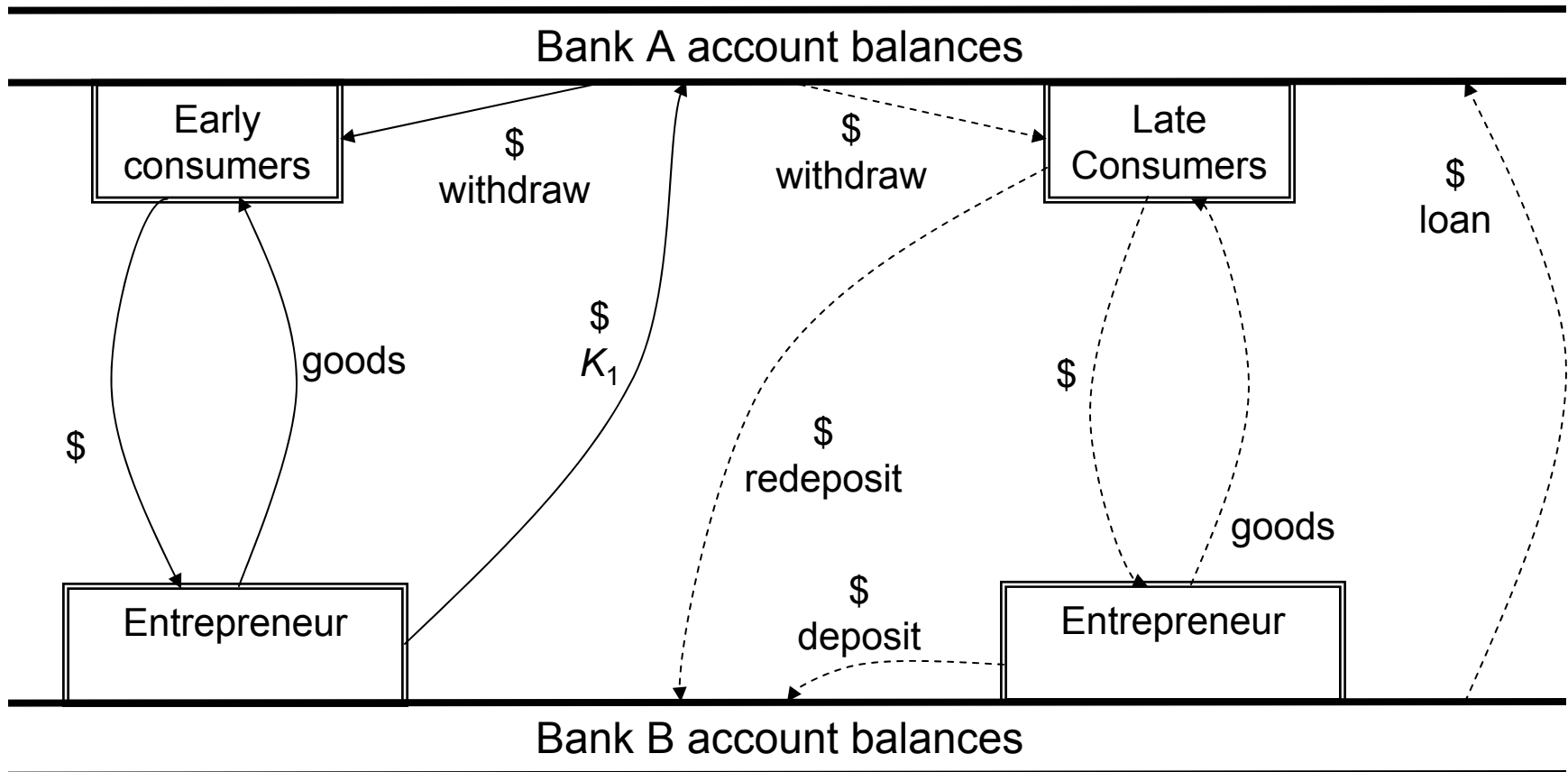
Result: $\lambda^p = \lambda \Rightarrow$ *No Purchase Runs*

Result: *Entrepreneur provides optimal goods*

- $(c_1, c_2) = (c_1^*, c_2^*)$

II. Clearinghouse Model

Transactions at $t=1$



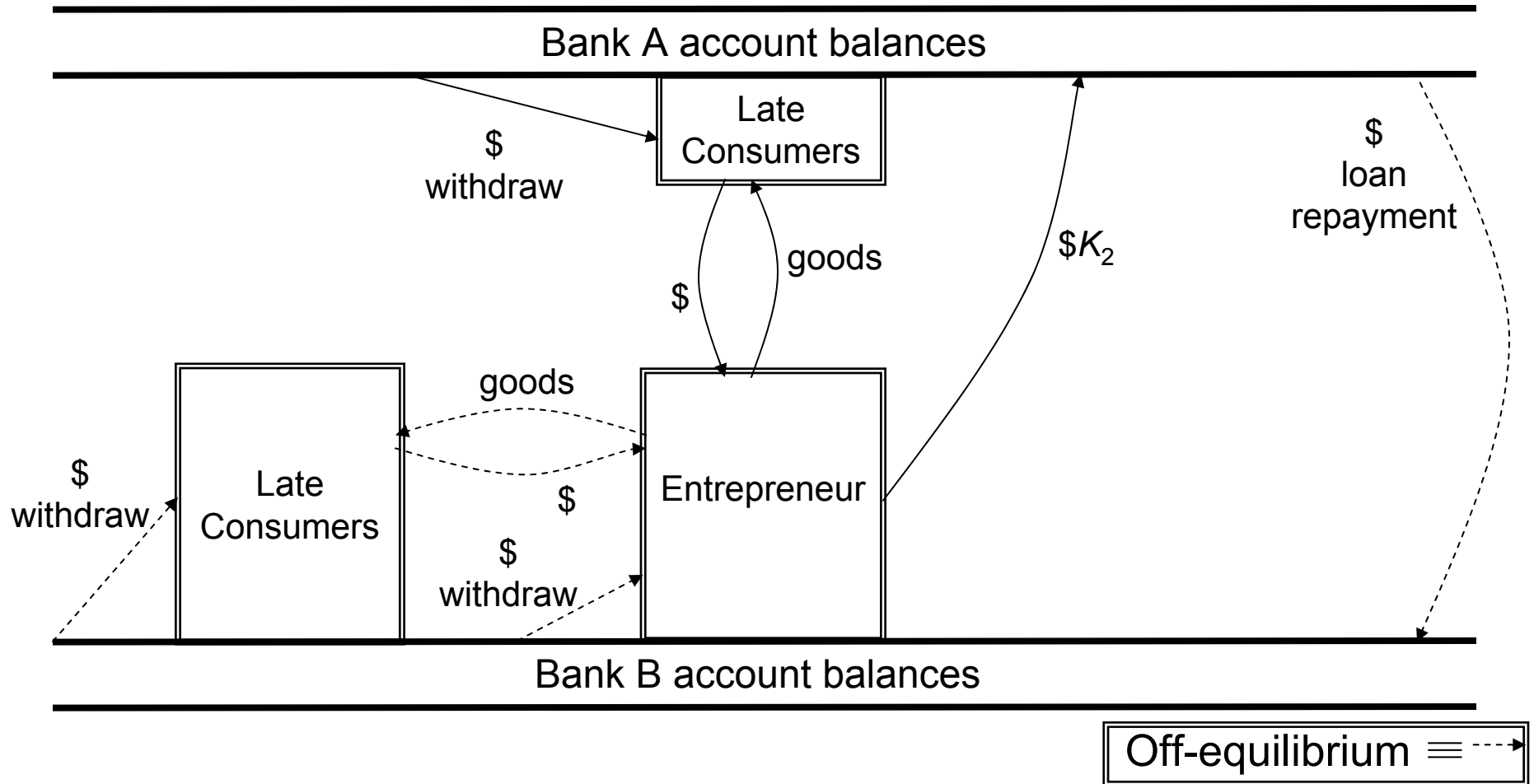
Off-equilibrium \equiv ----->

“Payment-in-the-Same-Period” Constraint:

$$\$ \text{ paid}(t) \leq \$ \text{ received}(t)$$

II. Clearinghouse Model

Transactions at $t=2$



Banks

Bank B makes take-it-or-leave-it loan offer to Bank A at $t=1$

- Return of D_2^F

Bank B pays D_2^B on deposits from $t=1$ to $t=2$

Assumption: Demand deposits senior to interbank loans

Result: *Bank A does not default even if all consumers withdraw early*

- All funds needed by Bank A held by Bank B
- $D_2^B = D_2^F = \frac{D_2}{D_1}$
- Bank A owes $D_2^F = \frac{D_2}{D_1}$ to Bank B instead of to late consumers who run
- Interbank lending is greatest return to Bank B

Consumers

Suppose there is a “Redeposit Run”:

⇒ Requires either:

i. Bank A is expected to default
⇒ Contradiction

ii. $\frac{D_1 D_2^B}{P_2} > \frac{D_2}{P_2} \Rightarrow D_2^B > \frac{D_2}{D_1}$
⇒ Contradiction

Result: *There is never a “Redeposit Run”*

**Result: *No bank runs and $(c_1, c_2) = (c_1^*, c_2^*)$
⇒ *Deposit insurance not justified****

Conclusion

Why few bank runs in U.S. post-Great Depression?

- Deposit insurance is capped
- Alternative explanation: model of banking with money
 1. Flexible value of money
Nominal deposits \Rightarrow No “purchase runs”
 2. Modern electronic clearinghouse
Clearinghouse model \Rightarrow No “redeposit runs”

\Rightarrow Diamond-Dybvig liquidity rationalization for deposit insurance:

- Justified for developing countries
- Not necessarily justified for developed countries
- But deposit insurance mostly in developed countries
 \Rightarrow Private interests theory?

Next Steps

Other triggers for bank runs than Diamond-Dybvig multiple equilibria:

- Asset shocks
 - Aggregate shocks don't cause runs
 - Interbank lending breakdowns and asymmetric information
 - Cause contagion and require Lender of Last Resort rather than deposit insurance
- ⇒ All have liquidity component due to liability/asset mismatch
- ⇒ Need nominal deposits to examine